On the Electro-magnetic Properties of metalliferous Veins in the Mines of Cornwall. *By* Robert Were Fox, *of Falmouth. Communicated by the President.* Read June 10, 1830. [*Phil. Trans.* 1830, *p.* 399.]

The author having been led from theory to entertain the belief that a connexion existed between electric action in the interior of the earth, and the arrangement of metalliferous veins, and also the progressive increase of temperature in the strata of the earth as we descend from the surface, proceeded to the verification of this opinion by experiment. His first trial was unsuccessful; but in the second he obtained decisive evidence of considerable electrical action in the mine of Huel Jewel in Cornwall. His apparatus consisted of small plates of sheet copper, which were fixed in contact with one in the veins by copper nails, or else wedged closely against them with wooden props stretched across the galleries. Between two of these plates at different stations, a communication was made by means of copper wire one twentieth of an inch in diameter, which included a galvanometer in its circuit. In some instances, 300 fathoms of copper wire were employed.

The intensity of the electric currents was found to differ considerably in different places; it was generally greater in proportion to the greater abundance of copper ore in the veins, and in some degree also to the depth of the stations. Hence the discovery of the author seems likely to be of practical utility to the miner in discovering the relative quantity of ore in veins, and the directions in which it most abounds. The electricity thus perpetually in action in mines does not appear to be influenced by the presence of the workmen and candles, or even by the explosion of gunpowder in blasting.

The author's experiments enable him to give a table of the relative powers of conducting galvanic electricity possessed by various metalliferous minerals. This power, he remarks, appears to bear no obvious relation to any of the electrical or other physical properties of the metals themselves, when in a proper state, or to the proportions in which they exist in combination. He proceeds to point out various facts relative to the position of veins, and the arrangement of their contents, which he thinks are irreconcileable with any of the hypotheses that have been devised to explain their origin.

He observes that ores which conduct electricity have generally some conducting substances interposed in the veins between them and the surface; a structure that appears to bear a striking analogy to the ordinary galvanic combinations. He is of opinion that the intensities both of heat and of electricity, and consequently of magnetism, increase in proportion to the depths of the strata under the surface of the earth; that they have an intimate connexion with one another; and that the discovery of electrical currents in various and frequently opposite directions, in different parts of the same mine, may perhaps, hereafter, afford a clue to explain the declination and variation of the magnetic needle.